Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Due: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Le Fevre High School

**MATHEMATICS: IBMYP Year 5**

**Project:** Measuring heights using a clinometer

**Australian Curriculum:** Pythagoras and Trigonometry

**Unit Objectives:**

* Develop mathematical skills and apply them.
* Develop the ability to reflect upon and evaluate the significance of their work and the work of others

**Area of Interaction**: Approaches to Learning.

**Task**:

1. In pairs**, construct a clinometer** using the materials provided.
2. Find **the length of your normal paces**. This can be done by counting the number of paces over a 20m distance and finding the average length of one pace.
3. Now you can **measure lengths on the ground** and **angles of elevation** reasonably accurately (using a clinometer). You can use them to find estimates of the heights of some tall objects around the school. (PAC building, a tall tree, a stobie pole along Hart Street, A block and another reasonably tall object)The information that you need to gather is shown in the diagram below. Repeat the measurements from a different position.

Angle of elevation

β

C:\Users\yanny\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\M9TS27N9\MC900383588[1].wmf

Distance from object

**Data**: Record your data in a table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Object** | **Distance** | | **Angle of elevation (o)** |
| **Paces** | **meters** |
| PAC building (1) |  |  |  |
| PAC building (2) |  |  |  |
| a tall tree (1) |  |  |  |
| a tall tree (2) |  |  |  |
| a stobie pole along Hart Street (1) |  |  |  |
| a stobie pole along Hart Street (2) |  |  |  |
| A block (1) |  |  |  |
| A block (2) |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Write a report addressing the following questions:**

1. With the aid of a neat, clearly labelled diagram, describe how a clinometer works.
2. Describe how you found the average length of your pace. Show your calculations.
3. Show the measurements you took in a table as suggested above.
4. Using an appropriate mathematical process to calculate the height of the triangle (in the diagram) for each object. Show all calculations.
5. a) These answers do not give the true height of the objects. What single measurement must you consider? Why? How do you use it to find the heights from your results? (If you are not sure of the answers to these questions, have another good look at the diagram!)
6. Find the measurement concerned in question 5 and use it to calculate your estimate of the height of each object. Show your answers clearly.
7. How accurate do you think your answers are? Are they accurate to the nearest cm, m, 2m or 10m? Explain your reasoning.
8. When you did your measurements you had to make sure certain conditions were satisfied. What sort of things did you have to be careful of in the practical situation so that the heights could be found using right-angled triangle methods?
9. Describe situations where you could NOT find the height of an object using this method.

Refer to the IB assessment criteria on how to achieve a particular level.

**Assessment Criteria**

|  |  |  |
| --- | --- | --- |
| Criterion B | | |
| Investigating Patterns | | |
| **Level** | **IB MYP Descriptor** | **Clarification** |
| 0 | The student does not reach a standard described by any of the descriptors given below. | * You do none of the following described below. |
| 1–2 | The student **applies**, **with some guidance**, mathematical problem-solving techniques to recognize **simple** patterns. | * **No election and application of relevant mathematical processes** evident * **Little information collection** evident |
| 3–4 | The student **selects and applies** mathematical problem-solving techniques to recognize patterns, and **suggests** relationships or general rules. | * Selection and application of relevant mathematical processes **evident** * **Some attempt to collect the data** correctly |
| 5–6 | The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, and **draws conclusions** consistent with findings. | * Selection and application of relevant mathematical processes **evident** and **some attempt** to solve the problem. (1,2,4) * **Briefly describe** the mathematical problems as general rules and justify your answers.(5 &6) * **Fairly correct and neat** data table shown (data table) |
| 7–8 | The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, **draws conclusions** consistent with findings, and **provides justifications or proofs**. | * Selection and application of relevant mathematical processes to solve the problem to **recognise clear patterns**. (1,2,4) * **Thoroughly describe** the mathematical problems as general rules and **clearly justify your answers**.(5 &6) * **Correct data table** shown, the table is neat, accurate and represents the correct data (data table) |

|  |  |  |
| --- | --- | --- |
| Criterion C | | |
| Communication in Mathematics | | |
| **Level** | **IB MYP Descriptor** | **Clarification** |
| 0 | The student does not reach a standard described by any of the descriptors given below. | * You do **none** of the following described below. |
| 1–2 | The student shows **basic** use of mathematical language **and/or** forms of mathematical representation. The lines of reasoning are **difficult to follow**. | * **Some evidence of written work** and some **attempts to answer the questions**. * The written work is **not well presented** |
| 3–4 | The student shows **sufficient** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **clear** though not always **logical** or **complete**. The student moves between different forms of representation **with some success**. **Achievement level** | * **Not all questions** are answered in a thoughtful and accurate manner. * The explanations show **some consideration of the factors** involved * There is evidence that **some care** has been taken **in the presentation and the mathematical reasoning.** |
| 5–6 | The student shows **good** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **concise**, **logical** and **complete**. The student moves **effectively** between different forms of representation. | * **All questions** are answered in **a thoughtful and accurate manne**r. (1-9) * The explanations **show thoughtful consideration of the factors involve**d. (7,8,9) * The work is **neatly presented, diagrams are correctly labelled, mathematical reasoning is concise, logical and complete.** (1 -9) |